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Electro-optical apparatus e.g. LCD device has group of driving and pixel electrodes on layer insulation film opposing each other and connected through through-holes

Patent Assignee: SEIKO EPSON CORP (SHIH)
Number of Countries: 001 Number of Patents: 001
Patent Family:

Patent No	Kind	Date	Applicat No	Kind	Date	Week
JP 2000221529	A	20000811	JP 9925014	A	19990202	200053 B

Priority Applications (No Type Date): JP 9925014 A 19990202
Patent Details:

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JP 2000221529	A		8	G02F-001/1343	

Abstract (Basic): **JP 2000221529** A

NOVELTY - A layer insulation film (18) is formed on opposing internal side surface of substrate (12). Pixel electrodes (15A-15C) are respectively formed on the surface area of film (18) in which driving electrode group (14A-14C) oppose scanning electrode (16). The driving and pixel electrodes are connected through through-holes (19A-19C) formed on film (18).

USE - For e.g. reflecting type LCD device and electroluminescent display device.

ADVANTAGE - The number of electrodes which perform multiplexing is increased. Hence electro-optical apparatus with favorable display quality is provided.

DESCRIPTION OF DRAWING(S) - The figure shows the sectional view of LCD device.

Substrate (12)
Pixel electrodes (15A-15C)
Scanning electrode (16)
Layer insulation film (18)
Through-holes (19A-19C)
pp; 8 DwgNo 2/10

Title Terms: ELECTRO; OPTICAL; APPARATUS; LCD; DEVICE; GROUP; DRIVE; PIXEL; ELECTRODE; LAYER; INSULATE; FILM; OPPOSED; CONNECT; THROUGH; THROUGH; HOLE
Derwent Class: P81; P85; U14
International Patent Class (Main): G02F-001/1343
International Patent Class (Additional): G09F-009/30
File Segment: EPI; EngPI

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(71) Applicant: SEIKO EPSON CORP

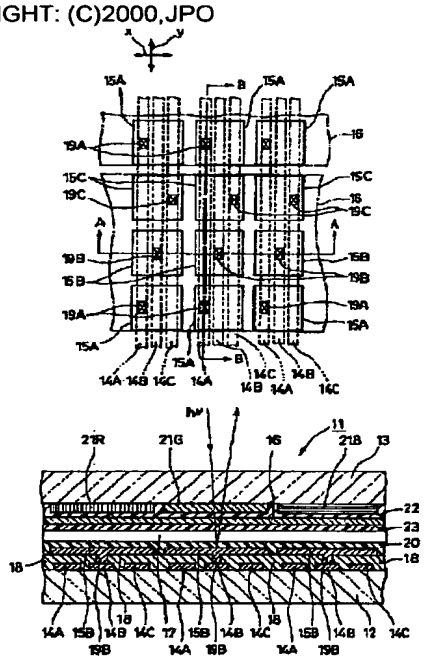
(72) Inventor: IINO SEIICHI

(54) ELECTRO-OPTIC DEVICE

(57) Abstract:

PROBLEM TO BE SOLVED: To provide an electro-optic device having good display quality with a high aperture ratio by increasing the number of the electrodes to be multiplexed.

SOLUTION: Plural scanning electrodes 16 formed in a stripe form are formed along a row direction on a front glass substrate 13 side and drive electrodes 14A, 14B and 14C constituting three groups are formed along a column direction on a rear glass substrate 12 side. Interlayer insulating films 18 are formed on the opposite inner flank of the rear glass substrate 12 formed with the drive electrodes. Respective three pixel electrodes 15A, 15B and 15C are formed along the column direction on the surfaces of the interlayer insulating film 18 of the regions where the drive electrode groups face the scanning electrodes 16. The drive electrodes 14A, 14B and 14C corresponding to these pixel electrodes 15A, 15B and 15C are connected via through-holes 19A, 19B and 19C formed on the interlayer insulating films 18. Since the aperture ratio of the pixel electrodes 15 can be greatly improved and the number of the drive electrodes can be increased by such constitution, the drive controllability and the display quality can be improved.



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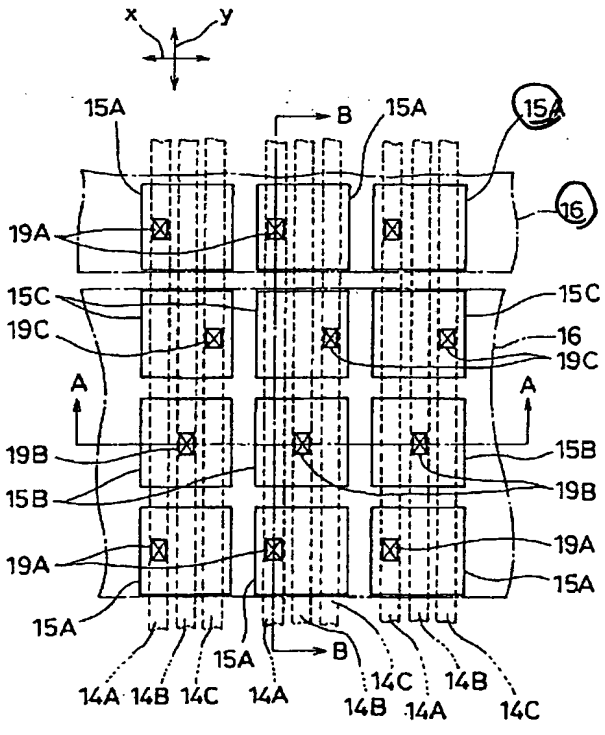
DA14 DB04 EA02 EA04 EA05
EA07

(54)【発明の名称】　電気光学装置

(57)【要約】
【課題】　多重化される電極数を増加し高開口率で表示品質の良好な電気光学装置を提供する。
【解決手段】　前ガラス基板１３側にストライプ状に形成された複数の走査電極１６が行方向に沿って形成され、後ガラス基板１２側に３本の群をなす駆動電極１４Ａ、１４Ｂ、１４Ｃが列方向に沿って形成され、駆動電極を形成した後ガラス基板１２の対向内側面に層間絶縁膜１８が形成されている。駆動電極群が走査電極１６と対向する領域の層間絶縁膜１８の表面にそれぞれ３つの画素電極１５Ａ、１５Ｂ、１５Ｃが列方向に沿って形成され、これらの画素電極１５Ａ、１５Ｂ、１５Ｃに対応する駆動電極１４Ａ、１４Ｂ、１４Ｃが層間絶縁膜１８に形成したスルーホール１９Ａ、１９Ｂ、１９Ｃを介して接続されている。このような構成により、画素電極１５の開口率を大幅に向上できるとともに、駆動電極数を増やすことができるため駆動制御性や表示品質を向上できる。



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【特許請求の範囲】

【請求項１】　相対向して対をなす第１の基板と第２の基板のうち、少なくとも一方が表示用光に対して透過性を有し、前記第１の基板の対向内側面に所定方向に沿って互いに平行をなす複数本で群を構成する第１の電極が複数群、互いに略平行に形成され、かつ前記第２の基板の対向内側面に前記第１の電極に交差する方向に沿って互いに略平行な複数の第２の電極が形成され、前記第１の基板と前記第２の基板との間に電気光学材料層が介在された電気光学装置であって、

前記第１の電極を含む前記第１の基板の対向内側面に層間絶縁膜が形成され、前記第２の電極と前記第１の電極の群との、それぞれの交差位置における前記層間絶縁膜の表面に、前記群を構成する前記第１の電極と同数の画素電極の群が、前記第２の電極と対向するように配置、形成され、かつ前記第１の電極の群の延在方向に沿って前記画素電極の群が列をなすとともに、それぞれの前記交差位置で、前記画素電極の群と前記第１の電極の群のうちのそれぞれ対応するものどうしが、前記層間絶縁膜に形成されたスルーホールを介して接続されていることを特徴とする電気光学装置。

【請求項２】　前記電気光学材料層は、液晶であることを特徴とする請求項１記載の電気光学装置。

【請求項３】　前記画素電極は表示用光に対して反射性を有する導電性材料で形成され、前記第２の基板および前記第２の電極は表示用光に対して透過性を有することを特徴とする請求項２記載の電気光学装置。

【請求項４】　前記画素電極、前記層間絶縁膜、前記第１の電極、前記第１の基板、前記第２の基板、および前記第２の電極は、表示用光に対して透過性を有するとともに、前記第１の基板の後方に照明手段を備えることを特徴とする請求項２記載の電気光学装置。

【請求項５】　前記第１の電極は駆動電極であり、前記第２の電極は走査電極であることを特徴とする請求項１ないし請求項４のいずれかに記載の電気光学装置。

【発明の詳細な説明】

【０００１】

【発明の属する技術分野】本発明は電気光学装置に関し、さらに詳しくは多重マトリクス構成された電極構造を有する液晶表示装置、エレクトロルミネッセンス（ＥＬ）ディスプレなどの電気光学装置に関する。

【０００２】

【従来の技術】従来、電極が多重マトリクス構成された電気光学装置としては、図８～図１０に示すような二重マトリクス構成の液晶表示装置１が知られている。図８は液晶表示装置の電極パターンを示す平面図、図９は図８のＥ－Ｅ断面図、図１０は図８のＦ－Ｆ断面図である。図９および図１０に示すように、この液晶表示装置１は相対向するガラス基板２、３を有している。

【０００３】ガラス基板２におけるガラス基板３と対向する面には、表示領域を縦断する方向に延在された複数対の駆動電極４Ａ、４Ｂが平行に形成されている。これら駆動電極４Ａ、４Ｂは、例えばアルミニウムなどの光反射性を有する導電性材料で形成されている。図８に示すように、駆動電極４Ａは、矩形状の画素電極部４ＡＰと幅の狭い電極線部４ＡＬとが延在方向に沿って交互に配置された略櫛歯形状に形成されており、対をなす駆動電極４Ｂに向けて凹凸が形成されている。すなわち、凹部が電極線部４ＡＬが形成された部分に相当し、凸部が画素電極部４ＡＰが形成された部分に相当する。同様に駆動電極４Ｂも、対をなす駆動電極４Ａに向けて凹凸をなすように、矩形状の画素電極部４ＢＰと幅の狭い電極線部４ＢＬとが延在方向に沿って交互に配置された略櫛歯形状に形成されている。これら一対をなす駆動電極４Ａ、４Ｂは、画素電極部４ＡＰと電極線部４ＢＬとが対向し、画素電極部４ＢＰと電極線部４ＡＬとが対向するように、交互に入り組むように配置されている。このガラス基板２における駆動電極４Ａ、４Ｂを形成した面には、配向膜５が少なくとも表示領域全体に亙って形成されている。

【０００４】一方、ガラス基板３におけるガラス基板２と対向する面には、上記した駆動電極４Ａ、４Ｂと交差する方向に沿って表示領域を横断する複数の平行な走査電極６が形成されている。なお、これら走査電極６は、例えばＩＴＯ（indium tin oxide）などの透明導電性材料で形成されている。図８に示すように、走査電極６は、ガラス基板２側のそれぞれの対をなす駆動電極４Ａ、４Ｂに対して２つの隣接する画素電極部４ＡＰ、４ＢＰと対向するような幅寸法に設定されている。このガラス基板３における走査電極６を含む、ガラス基板２と対向する面には配向膜７が、少なくとも表示領域全体に亙って形成されている。

【０００５】そして、対向するガラス基板２、３間に、表示領域を取り囲むように図示しないシール材が配置・形成され、両ガラス基板２、３とシール材とで形成される空隙に液晶８が封止されて液晶表示装置１が大略構成されている。

【０００６】

【発明が解決しようとする課題】しかしながら、上記した液晶表示装置１では、駆動電極４Ａ、４Ｂの凹凸形状を利用して互いに入り組む電極構造であるため、走査電極６に対向する、互いに隣接する画素電極部４ＡＰ、４ＢＰの幅寸法が対向する電極線部４ＢＬ、４ＡＬの幅寸法により制約を受けるため開口率をさらに大きくすることが困難であった。また、開口率を大きくしようとすると電極線部４ＡＬ、４ＢＬを細くせざるを得ず、駆動電極４Ａ、４Ｂの電気抵抗が大きくなるという問題点があった。また、このような電極構造では、３本以上の群をなす駆動電極が同一の走査電極に３つ以上の画素電極部で対向する多重マトリクス構成とすることが構造的に困

難であった。さらに、電極線部４ＡＬ、４ＢＬと走査電極６との間の液晶８が駆動されて不要な表示が行われるという問題点があった。

【０００７】そこで、本発明が解決しようとする課題は、多重化される電極数を増加できるとともに、開口率を高くすることができ、しかも表示品質の良好な電気光学装置を得るには、どのような手段を講じればよいかという点にある。

【０００８】

【課題を解決するための手段】上記した課題を解決するため、本発明で講じる手段は、相対向して対をなす第１の基板と第２の基板のうち、少なくとも一方が表示用光に対して透過性を有し、第１の基板の対向内側面に所定方向に沿って互いに平行をなす複数本で群を構成する第１の電極が複数群、互いに略平行に形成され、かつ第２の基板の対向内側面に第１の電極に交差する方向に沿って互いに略平行な複数の第２の電極が形成され、第１の基板と第２の基板との間に電気光学材料層が介在された電気光学装置であって、第１の電極を含む第１の基板の対向内側面に層間絶縁膜が形成され、第２の電極と第１の電極の群との、それぞれの交差位置における層間絶縁膜の表面に、群を構成する第１の電極と同数の画素電極の群が、第２の電極と対向するように配置、形成され、かつ第１の電極の群の延在方向に沿って画素電極の群が列をなすとともに、それぞれの交差位置で、画素電極の群と第１の電極の群のうちのそれぞれ対応するものどうしが、層間絶縁膜に形成されたスルーホールを介して接続されていることを特徴とする。

【０００９】このような構成の本発明によれば、群をなす第１の電極と第２の電極とが交差する位置の層間絶縁膜の表面に第２の電極と対向する複数の画素電極が配置され、これら画素電極に対応する第１の電極が層間絶縁膜に形成されたスルーホールを介して画素電極に接続されているため、第１の電極の形成スペースにより画素電極の形成スペースが規制されることがなく、画素形成領域の面積（表示領域の面積を総画素数で割った面積）に画素電極面積を近づけることができ、すなわち高い開口率を実現することが可能となる。加えて、本発明では画素電極が第１の電極の影響を受けないため、画素電極の形状を自由に設定できる。また、第１の電極を画素電極の幅寸法内で第２の電極と第１の電極の群の交差位置（層間絶縁膜上）に画素電極を複数（特に３以上）形成することが構造的に容易であり、マトリクスの多重化を図ることができる。さらに、第１の電極が層間絶縁膜の下に形成されるため、第１の電極が直接、電気光学材料へ電気光学作用を与えることを防止することができ、表示品質の向上を図ることができる。

【００１０】また、本発明は、電気光学材料層として液晶を第１の基板と第２の基板との間に介在させることが好ましい。このように液晶を電気光学材料として用いることにより、開口率が高く表示品質の良好な液晶表示装置を実現することができる。

【００１１】さらに、本発明は、画素電極が表示用光に対して反射性を有する導電性材料で形成され、第２の基板および第２の電極は表示用光に対して透過性を有することことが好ましい。このような構成の本発明によれば、反射型液晶表示装置の多重マトリクス化を容易にすることができる。すなわち、第２の電極と交差する第１の電極の群を構成するそれぞれの第１の電極が交差位置の画素電極に接続されているため、所定の第１の電極へ選択的に電圧印加を行うことで、第２の電極と所定の画素電極との間に電界を発生させることができ、これら第２の電極と画素電極との間に介在される液晶を駆動することができる。特に、本発明では、第１の電極が層間絶縁膜の下に形成されるため、第１の電極が直接、液晶の配向を変化させる作用を有しないため、適正な表示に不要な反射光が生じるのを防止することができ、表示品質を向上することができる。

【００１２】また、本発明は、画素電極、層間絶縁膜、第１の電極、第１の基板、第２の基板、および第２の電極が表示用光に対して透過性を有するとともに、第１の基板の後方に照明手段を備えることにより、多重マトリクス構成の透過型液晶表示装置を実現することができる。具体的には、例えば画素電極をＩＴＯ、層間絶縁膜を酸化シリコン（ＳｉＯｘ）や窒化シリコン（ＳｉＮｘ）、後配線をＩＴＯ、第１の基板を透明なガラスや合成樹脂で形成することができる。

【００１３】さらに、本発明は、第２の電極が走査電極であり、第１の電極が駆動電極であることが好ましい。このような構成の本発明によれば、走査電極の数を増加させることなく駆動電極数を増やすことができ、駆動制御が簡単で高精細な電気光学装置を実現することができる。

【００１４】

【発明の実施の形態】以下、この発明に係る電気光学装置の詳細を図面に示す実施形態に基づいて説明する。

【００１５】（実施形態１）図１～図３は、本発明に係る電気光学装置を反射型の液晶表示装置に適用した実施形態１を示している。本実施形態１の液晶表示装置は３重マトリクス構成されている。なお、図１は本実施形態１の液晶表示装置の電極構造を示す平面図、図２は図１のＡ－Ａ断面に相当する断面図、図３は図１のＢ－Ｂ断面に相当する断面図である。

【００１６】本実施形態１の液晶表示装置１１は、図２および図３に示すように、対向する一対の、第１の基板としての後ガラス基板１２と、第２の基板としての前ガラス基板１３とを備え、後ガラス基板１２の前ガラス基板１３と対向する面側に列方向（図１中矢印ｙで示す方向）に沿って互いに平行に形成された、第１の電極としての複数群の駆動電極１４（１４Ａ、１４Ｂ、１４Ｃ）

と、この駆動電極１４に接続された反射画素電極１５（１５Ａ、１５Ｂ、１５Ｃ）とが設けられ、前ガラス基板１３の後ガラス基板１２と対向する面側に行方向（図１中矢印ｘで示す方向）に沿って延在されて互いに平行に形成された第２の電極としての複数の走査電極１６が設けられ、これら後ガラス基板１２と前ガラス基板１３との間に液晶１７が封止されて大略構成されている。

【００１７】ここで、後ガラス基板１２側の構成を具体的に説明する。本実施形態１では、後基板として後ガラス基板１２を用いたが、この後ガラス基板１２は透明である必要はない。この後ガラス基板１２の対向内側面（前ガラス基板１３と対向する面）には、図１に示すように列方向（図中矢印ｙで示す）に沿って互いに平行に形成された、３本ずつの群をなす駆動電極１４Ａ、１４Ｂ、１４Ｃが複数群、互いに平行に形成されている。なお、本実施形態１では群を構成する駆動電極１４Ａ、１４Ｂ、１４Ｃは、列方向に並ぶ後記する反射画素電極１５の下に収まるように間隔が設定されている。このようにストライプ状に駆動電極１４が形成された後ガラス基板１２の対向内側面には、これら駆動電極１４を覆うように層間絶縁膜１８が所定の膜厚に堆積されている。なお、この層間絶縁膜１８としては、例えばにて形成される酸化シリコン（ＳｉＯｘ）や窒化シリコン（ＳｉＮｘ）などを用いることができる。

【００１８】そして、この層間絶縁膜１８の上には、以下に説明する配置で反射画素電極１５の列が複数、互いに平行に形成されている。すなわち、層間絶縁膜１８の上に配置される反射画素電極１５は、それぞれの駆動電極１４の群（１４Ａ、１４Ｂ、１４Ｃ）の延在方向（列方向、矢印ｙ方向）に沿って層間絶縁膜１８の表面に列をなすように形成されている。その結果、それぞれの反射画素電極１５の列は、前ガラス基板１３側に平行に形成された走査電極１６に対して、液晶１７などを介して交差（直交）するように対向している。それぞれの走査電極１６の幅域内には、列方向に配置された反射画素電極１５の列のうち３つの反射画素電極１５Ａ、１５Ｂ、１５Ｃの群が収まるように対向・配置されている。このように群をなす３つの反射画素電極１５Ａ、１５Ｂ、１５Ｃは、走査電極１６と、反射画素電極１５の列とが交差する位置にそれぞれ配置されている。反射画素電極１５の列は、順次走査電極１６に対向する３つの反射画素電極１５Ａ、１５Ｂ、１５Ｃの順を繰り返しながら列方向に沿って表示領域を縦断するように設定されている。

【００１９】これら反射画素電極１５Ａ、１５Ｂ、１５Ｃは、層間絶縁膜１８の下に形成された３本の駆動電極１４Ａ、１４Ｂ、１４Ｃに対して、それぞれ対応する駆動電極１４と、層間絶縁膜１８に形成されたスルーホール１９を介して接続されている。具体的には、反射画素電極１５Ａがスルーホール１９Ａを介して駆動電極１４Ａに接続され、反射画素電極１５Ｂがスルーホール１９Ｂを介して駆動電極１４Ｂに接続され、反射画素電極１５Ｃがスルーホール１９Ｃを介して駆動電極１４Ｃに接続されている。

【００２０】なお、このように層間絶縁膜１８に形成したスルーホール１９を介して下地駆動電極１４と反射画素電極１５とを接続する構造とするには、層間絶縁膜１８の所定位置（各画素電極領域内）に、フォトリソグラフィー技術およびエッチング技術を用いてスルーホール１９を開口してそれぞれの駆動電極１４（１４Ａ、１４Ｂ、１４Ｃ）を露呈させた後、反射画素電極１５を構成する材料金属（例えばアルミニウム、銀、クロムなど）をスパッタ法などを用いてスルーホール１９の埋め込みと層間絶縁膜１８上への堆積を行った後、フォトリソグラフィー技術およびエッチング技術を用いて反射画素電極１５のパターニングを行うことで形成できる。また、スルーホール１９内に埋め込みプラグを形成した後、画素電極材料を層間絶縁膜１８上に堆積させ、次いで画素電極１５のパターニングを行ってもよい。なお、この画素電極１５（１５Ａ、１５Ｂ、１５Ｃ）のパターニングでは、画素電極どうしの間隔を極力狭く設定することで画素開口率を高めることができる。なお、このように画素電極１５どうしの間隔を狭くしても、駆動電極１４（１４Ａ、１４Ｂ、１４Ｃ）は層間絶縁膜１８の下に形成されるため、画素電極１５の形成領域を駆動電極１４が干渉することがない。

【００２１】このように複数列をなす画素電極１５（１５Ａ、１５Ｂ、１５Ｃ）を含めて層間絶縁膜１８上には、少なくとも表示領域全体に亙って後配向膜２０が形成されている。

【００２２】次に、上記した後ガラス基板１２と対向する前ガラス基板１３側の構成をより具体的に説明する。前ガラス基板１３の対向内側面（後ガラス基板１２と対向する面）には、上記した後ガラス基板１２に形成された画素電極１５のそれぞれの列と対向するように列方向に沿って画素電極１５と略同一の幅寸法のカラーフィルタ２１がストライプ状に形成されている。カラーフィルタ２１は、赤用のカラーフィルタ２１Ｒ、緑用のカラーフィルタ２１Ｇ、青用のカラーフィルタ２１Ｂの順で繰り返すように配置されている。これらカラーフィルタ２１Ｒ、２１Ｇ、２１Ｂを含めて前ガラス基板１３の対向内側面の少なくとも表示領域全体に亙って保護膜２２が形成されている。保護膜２２の表面には、上記した透明電極としての複数の走査電極１６が行方向にストライプ状に形成されている。さらに、走査電極１６を含む保護膜２２の表面には、少なくとも表示領域全体に亙って前配向膜２３が形成されている。

【００２３】以上、後ガラス基板１２側および前ガラス基板１３側の構成を説明したが、これらは、表示領域を囲むように配置・形成された図示しないシール材を介して配向膜２０、２３どうしが所定のギャップを介して対

向するように貼り合わされ、後配向膜２０と前配向膜２３とシール材とで形成される間隙に液晶１７が封止されて、液晶表示装置１１が構成されている。

【００２４】以上、本実施形態１の液晶表示装置１１の構成について説明したが、本実施形態１においては、走査電極１６と駆動電極１４の群（１４Ａ、１４Ｂ、１４Ｃ）とが交差する領域にそれぞれの駆動電極１４Ａ、１４Ｂ、１４Ｃに対応する３つの画素電極１５Ａ、１５Ｂ、１５Ｃが対向するため、３重マトリクス構成を実現している。このように走査電極１６と駆動電極１４の群（１４Ａ、１４Ｂ、１４Ｃ）との交差領域に形成される画素電極１５Ａ、１５Ｂ、１５Ｃは駆動電極１４Ａ、１４Ｂ、１４Ｃに干渉を受けずに画素形成領域に近い面積まで大きくすることができるため、開口率を向上することができ、輝度の高い表示を行うことが可能となる。また、駆動電極１４も画素電極１５の干渉を受けないため、１本の走査電極１６に対して多重化される駆動電極の本数を増やすことが可能となる。このように駆動電極本数の増加や開口率の向上を図ることができるため、高精細で良好な表示が行える多重マトリクス構成の反射型液晶表示装置を実現することができる。図２および図３は、緑用のカラーフィルタ２１Ｇに入射した外光が、液晶１７で変調されつつ反射画素電極１５Ｂで反射されて表示光として出射する状態を示している。なお、本実施形態１においては、カラーフィルタ２１Ｒ、２１Ｇ、２１Ｂをそれぞれ列方向に沿って形成したが行方向に沿ってストライプ状に形成してもよい。

【００２５】（実施形態２）図４は、本発明に係る電気光学装置を透過型の液晶表示装置に適用した例を示している。なお、本実施形態２は、後ガラス基板１２、駆動電極１４、層間絶縁膜１８、画素電極１５が共に透明材料で構成され、後ガラス基板１２の後方に照明装置としてのバックライトシステム２４を備えた構成である点以外は、上記した実施形態１と同様であるため同一部分に同一の符号を付して説明を省略する。本実施形態２では、バックライトシステム２４からの光を各画素部分で変調して所定のカラーフィルタ２１を通して前方へ出射する。バックライトシステム２４は、光源２４Ａと反射板２４Ｂと導光板２４Ｃなどを備えてなる。なお、本実施形態２の作用・効果は上記した実施形態１と同様である。

【００２６】（実施形態３）図５～図７は、本発明に係る電気光学装置を反射型の液晶表示装置に適用した実施形態１の変形例である。図５は本実施形態３の液晶表示装置１１の電極構成を示す平面図、図６は図５のＣ－Ｃ断面に相当する断面図、図７は図５のＤ－Ｄ断面に相当する断面図である。なお、本実施形態３は、駆動電極の群が２本の駆動電極１４Ｄ、１４Ｅで構成され、走査電極１６と駆動電極群とが交差する対向位置に列方向に並ぶ２つの画素電極１５Ｄ、１５Ｅが走査電極１６と対向するように配置され、対応する画素電極１５Ｄと駆動電極１４Ｄとがスルーホール１９Ｄで接続されるとともに、対応する画素電極１５Ｅと駆動電極１４Ｅとがスルーホール１９Ｅで接続されたものである。また、前ガラス基板１３側には、カラーフィルタを有しない構成となっている。なお、本実施形態３における他の構成は上記した実施形態１と同様であるため、同一部分に同一の符号を付して説明を省略する。

【００２７】本実施形態３では、画素電極１５（１５Ｄ、１５Ｅ）の行方向の幅域内に２本の駆動電極１４（１４Ｄ、１４Ｅ）を配置するだけであるため、より幅寸法の長い駆動電極１４を形成することができ、駆動電極１４の低抵抗化を図ることができる。また、本実施形態３においても、層間絶縁膜１８の下に駆動電極１４を形成するためが、反射画素電極１５Ｄ、１５Ｅが駆動電極１４の制約を受けず画素形成領域に対する画素電極１５の面積占有率（開口率）を高めることができる。本実施形態３における他の作用・効果は、上記した実施形態１と同様である。

【００２８】以上、実施形態１～実施形態３について説明したが、本発明に係る電気光学装置は、これらに限定されるものではなく、構成の要旨に付随する各種の変更が可能である。例えば、上記した実施形態１では３本で群をなす駆動電極１４Ａ、１４Ｂ、１４Ｃと備える構成としたが、４本以上の群をなす駆動電極とすることもできる。また、上記した各実施形態は電気光学材料として液晶１７を用いた液晶表示装置に本発明を適用して説明したが、この他にエレクトロルミネッセンス材料を含む電荷輸送層や発光層などを備えたＥＬ層を介在させた構成の電気光学装置としてもよい。この場合、画素電極は例えばＩｎ－Ｍｇなどの仕事関数の低いカソード材料で形成することが好ましく、走査電極としては例えばＩＴＯなどの仕事関数の高いアノード材料で形成することが好ましい。さらに、上記した各実施形態では、走査電極に対して駆動電極を多重化する構成としたが、駆動電極に対して走査電極を多重化する構成とすることも可能である。

【図面の簡単な説明】

【図１】本発明に係る電気光学装置を反射型液晶表示装置に適用した実施形態１の電極構成を示す平面図。

【図２】図１のＡ－Ａ断面に相当する液晶表示装置の断面図。

【図３】図１のＢ－Ｂ断面に相当する液晶表示装置の断面図。

【図４】本発明に係る電気光学装置を透過型液晶表示装置に適用した実施形態２の断面図。

【図５】本発明に係る電気光学装置を反射型液晶表示装置に適用した実施形態３の電極構成を示す平面図。

【図６】図５のＣ－Ｃ断面に相当する液晶表示装置の断面図。

【図７】図５のＤ－Ｄ断面に相当する液晶表示装置の断面図。

【図８】従来の液晶表示装置の多重化マトリクス構成を示す電極の平面図。

【図９】図８のＥ－Ｅ断面に相当する液晶表示装置の断面図。

【図１０】図８のＦ－Ｆ断面に相当する液晶表示装置の断面図。

【符号の説明】

１１　液晶表示装置

１２　後ガラス基板

１３　前ガラス基板

１４（１４Ａ、１４Ｂ、１４Ｃ、１４Ｄ、１４Ｅ）　駆動電極

１５（１５Ａ、１５Ｂ、１５Ｃ、１５Ｄ、１５Ｅ）　画素電極

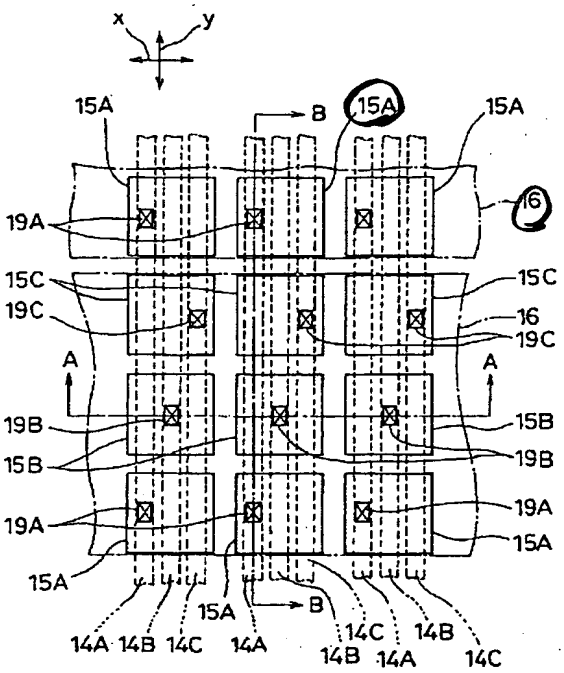
１６　走査電極

１７　液晶

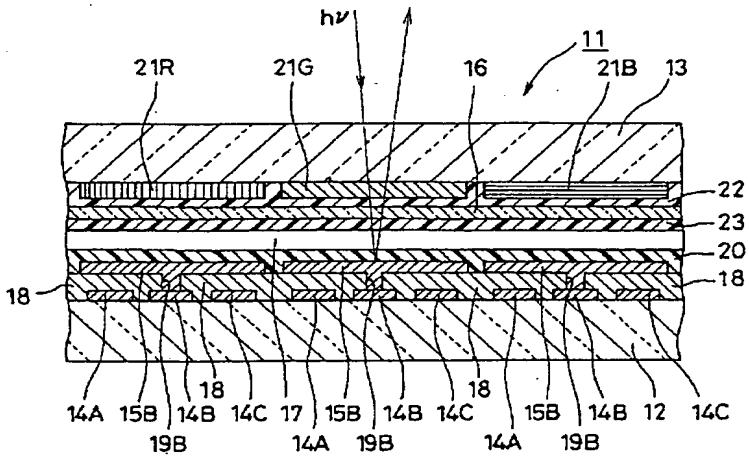
１８　層間絶縁膜

１９（１９Ａ、１９Ｂ、１９Ｃ、１９Ｄ、１９Ｅ）　スルーホール

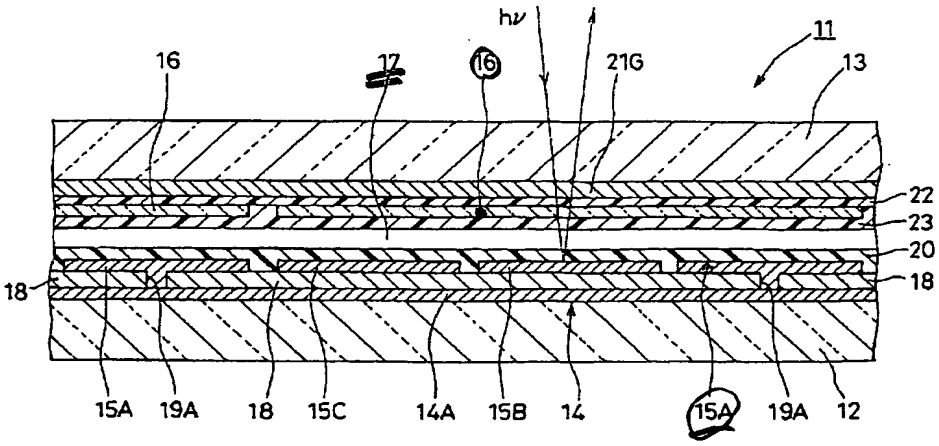
【図１】



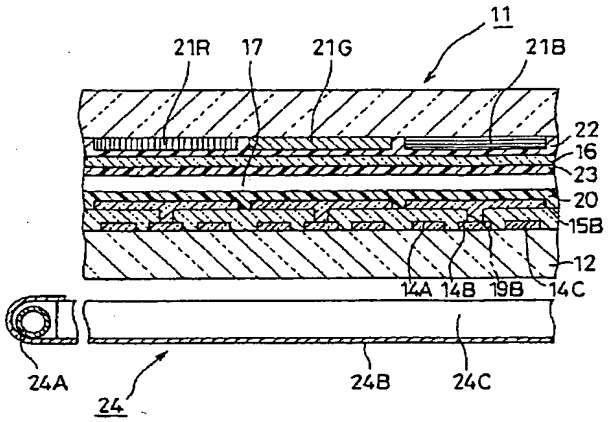
【図２】



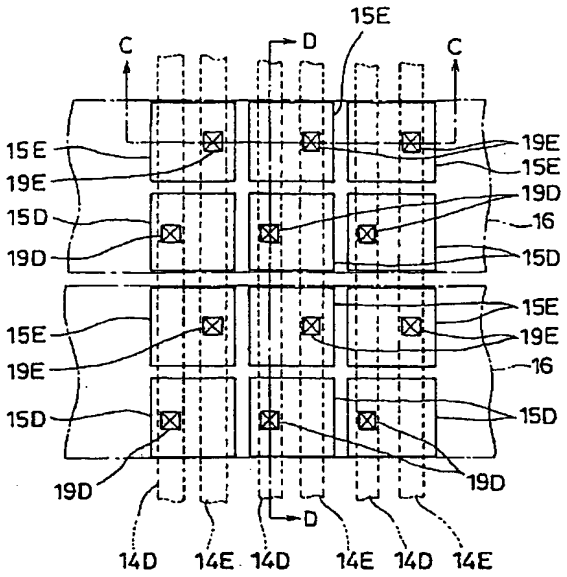
【図３】



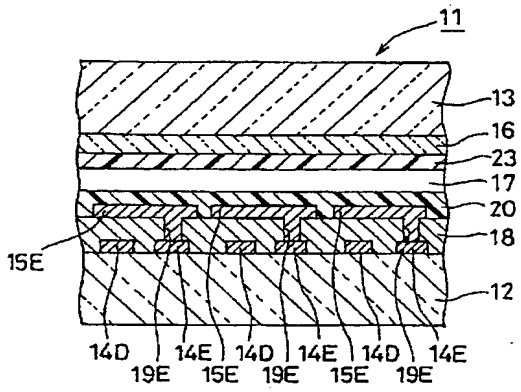
【図４】



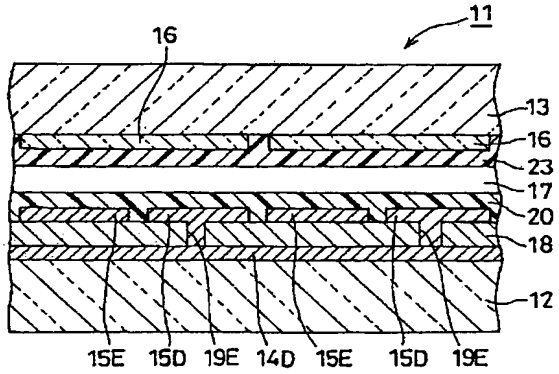
【図５】



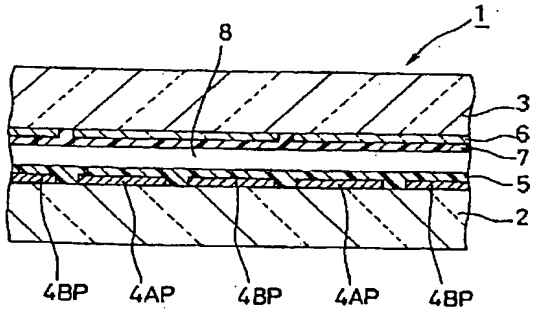
【図６】



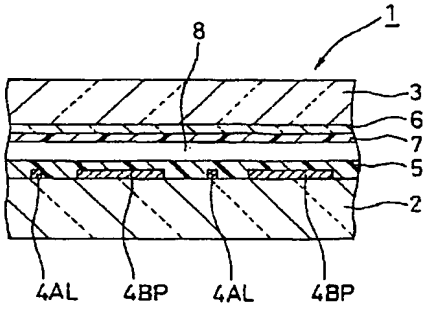
【図７】



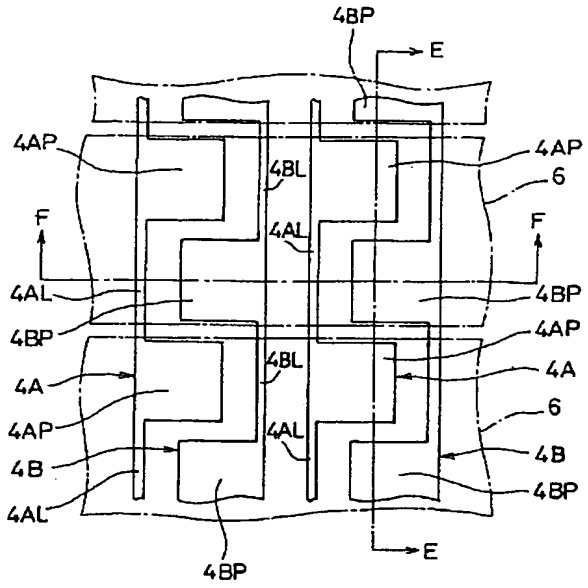
【図９】



【図１０】



【図８】


4BP
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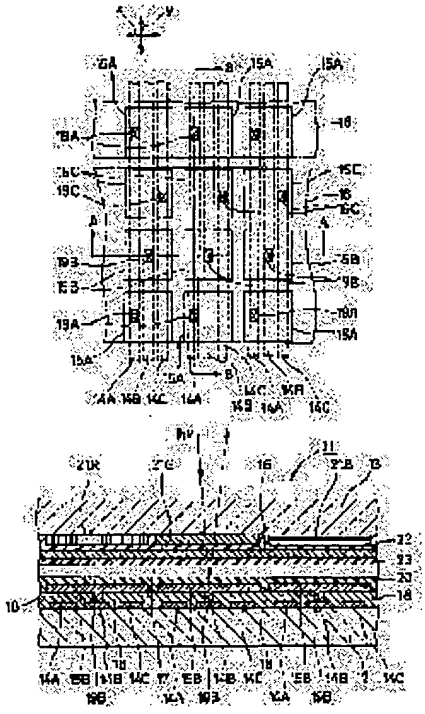
(54) ELECTRO-OPTIC DEVICE

(57)Abstract:

PROBLEM TO BE SOLVED: To provide an electro-optic device having good display quality with a high aperture ratio by increasing the number of the electrodes to be multiplexed.

SOLUTION: Plural scanning electrodes 16 formed in a stripe form are formed along a row direction on a front glass substrate 13 side and drive electrodes 14A, 14B and 14C constituting three groups are formed along a column direction on a rear glass substrate 12 side. Interlayer insulating films 18 are formed on the opposite inner flank of the rear glass substrate 12 formed with the drive electrodes. Respective three pixel electrodes 15A, 15B and 15C are formed along the column direction on the surfaces of the interlayer insulating film 18 of the regions where the drive electrode groups face the scanning electrodes 16. The drive electrodes 14A, 14B and 14C corresponding to these pixel electrodes 15A, 15B and 15C are connected via through-holes 19A, 19B and 19C formed on the interlayer insulating films 18. Since the aperture ratio of the pixel electrodes 15 can be greatly improved and the number of the drive electrodes can be increased by such constitution, the drive controllability and the display quality can be improved.



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CLAIMS

[Claim(s)]
[Claim 1] At least one side has permeability to the light for a display among the 1st substrate and the 2nd substrate which carry out phase opposite and make a pair. The 1st electrode which constitutes a group from two or more [it is mutually parallel to the opposite inside side of the 1st substrate of the above along the predetermined direction] Two or more groups, Two or more 2nd parallel electrodes are formed. the direction which is mutually formed in abbreviation parallel and intersects the 1st electrode of the above in the opposite inside side of the 2nd substrate of the above -- meeting -- mutual -- abbreviation -- It is electro-optics equipment with which the opto-electronics-material layer intervened between the 1st substrate of the above, and the 2nd substrate of the above. A layer insulation film is formed in the opposite inside side of the 1st substrate containing the 1st electrode of the above of the above. On the front face of the aforementioned layer insulation film in each intersection position with the group of the 2nd electrode of the above, and the 1st electrode of the above While being arranged and forming the group of the 1st electrode of the above which constitutes the aforementioned group, and the pixel electrode of the same number so that it may counter with the 2nd electrode of the above, and the group of the aforementioned pixel electrode making a train along the extension direction of the group of the 1st electrode of the above Electro-optics equipment characterized by connecting those to which it corresponds of the group of the aforementioned pixel electrode, and the groups of the 1st electrode of the above, respectively through the through hole formed in the aforementioned layer insulation film in each aforementioned intersection position.
[Claim 2] The aforementioned opto-electronics-material layer is electro-optics equipment according to claim 1 characterized by being liquid crystal.
[Claim 3] It is electro-optics equipment according to claim 2 which the aforementioned pixel electrode is formed with a conductive material which has reflection nature to the light for a display, and is characterized by the 2nd substrate of the above and the 2nd electrode of the above having permeability to the light for a display.
[Claim 4] The aforementioned pixel electrode, the aforementioned layer insulation film, the 1st electrode of the above, the 1st substrate of the above, the 2nd substrate of the above, and the 2nd electrode of the above are electro-optics equipment according to claim 2 characterized by having a lighting means behind the 1st substrate of the above while having permeability to the light for a display.
[Claim 5] It is electro-optics equipment according to claim 1 to 4 which the 1st electrode of the above is a drive electrode, and is characterized by the 2nd electrode of the above being a scanning electrode.

[Translation done.]

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[The technical field to which invention belongs] this invention relates to electro-optics equipments which have the electrode structure by which multiplex matrix composition was carried out, such as a liquid crystal display and an electroluminescence (EL) display, in more detail about electro-optics equipment.
[0002]
[Description of the Prior Art] Conventionally, as electro-optics equipment with which multiplex matrix composition of the electrode was carried out, the liquid crystal display 1 of double matrix composition as shown in drawing 8 - drawing 10 is known. The E-E cross section of drawing 8 and drawing 10 of the plan in which drawing 8 shows the electrode pattern of a liquid crystal display, and drawing 9 are the F-F cross sections of drawing 8 . As shown in drawing 9 and drawing 10 , this liquid crystal display 1 has the glass substrates 2 and 3 which carry out phase opposite.
[0003] Two or more pairs of drive electrodes 4A and 4B which extended in the direction which travels through a viewing area are formed in the glass substrate 3 in a glass substrate 2, and the field which counters in parallel. These drive electrodes 4A and 4B are formed with a conductive material which has light reflex nature, such as aluminum. As shown in drawing 8 , drive electrode 4A is formed in the abbreviation ctenidium configuration where rectangle-like pixel polar-zone 4AP and electrode line part 4AL with narrow width of face have been arranged by turns along the extension direction, and irregularity is formed towards drive electrode 4B which makes a pair. That is, a crevice is equivalent to the portion in which electrode line part 4AL was formed, and heights are equivalent to the portion in which pixel polar-zone 4AP was formed. Similarly, electrode line part 4BL with narrow rectangle-like pixel polar-zone 4BP and width of face is formed in the abbreviation ctenidium configuration arranged by turns along the extension direction so that irregularity may be made towards drive electrode 4A to which drive electrode 4B also makes a pair. The drive electrodes 4A and 4B which make these couples are arranged so that pixel polar-zone 4AP and electrode line part 4BL may counter, and pixel polar-zone 4BP and electrode line part 4AL may counter, and it may become intricate by turns. At least, the orientation film 5 covers the whole viewing area, and is formed in the field in which the drive electrodes 4A and 4B in this glass substrate 2 were formed.
[0004] On the other hand, two or more parallel scanning electrodes 6 which cross a viewing area along the direction which intersects the above-mentioned drive electrodes 4A and 4B are formed in the glass substrate 2 in a glass substrate 3, and the field which counters. In addition, these scanning electrode 6 is formed with transparent conductivity material, such as ITO (indium tin oxide). As shown in drawing 8 , the scanning electrode 6 is set as two adjoining pixel polar-zone 4APs, 4BP, and a width-of-face size that counters to the drive electrodes 4A and 4B which make each pair by the side of a glass substrate 2. At least, the orientation film 7 covers the whole viewing area, and is formed in the glass substrate 2 and the field which counters containing the scanning electrode 6 in this glass substrate 3.
[0005] And liquid crystal 8 is closed by the opening by which the sealant which is not illustrated so that a viewing area may be surrounded is arranged and formed, and is formed by both the glass substrates 2 and 3 and the sealant between the glass substrate 2 which counters, and 3, and profile composition of the liquid crystal display 1 is carried out.
[0006]
[Problem(s) to be Solved by the Invention] However, in order to receive restrictions with the width-of-face size of electrode line part 4BL and 4AL which the width-of-face size of pixel polar-zone 4AP and 4BP which counters the scanning electrode 6, and which adjoins mutually counters in the above-mentioned liquid crystal display 1 since it is the electrode structure which becomes intricate mutually using the shape of toothing of the drive electrodes 4A and 4B, it was difficult to enlarge a numerical aperture further. Moreover, when it was going to enlarge the numerical aperture, about electrode line part 4AL and 4BL, a thin kink colander was not obtained but there was a trouble that the electric

resistance of the drive electrodes 4A and 4B became large. Moreover, it was structurally difficult to consider as the multiplex matrix composition in which the drive electrode which makes three or more groups counters the same scanning electrode by three or more pixel polar zone with such electrode structure. Furthermore, there was a trouble that the liquid crystal 8 between electrode line part 4AL, 4BL, and the scanning electrode 6 drove, and an unnecessary display was performed.
[0007] Then, the technical problem which this invention tends to solve is in the point what means should be provided, in order to be able to make a numerical aperture high and to obtain the good electro-optics equipment of display quality moreover, while being able to increase the number of electrodes multiplexed.
[0008]
[Means for Solving the Problem] In order to solve the above-mentioned technical problem, the means provided by this invention At least one side has permeability to the light for a display among the 1st substrate and the 2nd substrate which carry out phase opposite and make a pair. The 1st electrode which constitutes a group from two or more [it is mutually parallel to the opposite medial surface of the 1st substrate along the predetermined direction] Two or more groups, Two or more 2nd parallel electrodes are formed. the direction which is mutually formed in abbreviation parallel and intersects the 1st electrode at the opposite medial surface of the 2nd substrate -- meeting -- mutual -- abbreviation -- It is electro-optics equipment with which the opto-electronics-material layer intervened between the 1st substrate and the 2nd substrate. A layer insulation film is formed in the opposite medial surface of the 1st substrate containing the 1st electrode. On the front face of the layer insulation film in each intersection position with the group of the 2nd electrode and the 1st electrode While being arranged and forming the group of the 1st electrode which constitutes a group, and the pixel electrode of the same number so that it may counter with the 2nd electrode, and the group of a pixel electrode making a train along the extension direction of the group of the 1st electrode It is characterized by connecting those to which it corresponds of the group of a pixel electrode, and the groups of the 1st electrode, respectively through the through hole formed in the layer insulation film in each intersection position.
[0009] According to this invention of such composition, the 2nd electrode and two or more pixel electrodes which counter are arranged on the front face of the layer insulation film of the position where the 1st electrode which makes a group, and the 2nd electrode cross. Since the 1st electrode corresponding to these pixel electrode is connected to the pixel electrode through the through hole formed in the layer insulation film, It becomes possible for the formation space of a pixel electrode not to be regulated by the formation space of the 1st electrode, and to be able to bring pixel electrode area close to the area (area which divided the area of a viewing area by the total number of pixels) of a pixel formation field, namely, to realize a high numerical aperture. In addition, in this invention, since a pixel electrode is not influenced of the 1st electrode, the configuration of a pixel electrode can be set up freely. Moreover, it is structurally easy to carry out two or more (3 or more [Especially]) formation of the pixel electrode for the 1st electrode within the width-of-face size of a pixel electrode in the intersection position (on a layer insulation film) of the group of the 2nd electrode and the 1st electrode, and multiplexing of a matrix can be attained. Furthermore, since the 1st electrode is formed in the bottom of a layer insulation film, it can prevent that the 1st electrode gives an electro-optics operation to an opto electronics material directly, and improvement in display quality can be aimed at.
[0010] Moreover, as for this invention, it is desirable to make liquid crystal intervene between the 1st substrate and the 2nd substrate as an opto-electronics-material layer. Thus, by using liquid crystal as an opto electronics material, a numerical aperture can realize the good high liquid crystal display of display quality.
[0011] furthermore, the thing for which this invention is formed with a conductive material into which a pixel electrode has reflection nature to the light for a display, and the 2nd substrate and the 2nd electrode have permeability to the light for a display -- things are desirable According to this invention of such composition, multiplex matrix-ization of a reflected type liquid crystal display can be made easy. Since each 1st electrode which constitutes the group of the 2nd electrode and the 1st crossing electrode is connected to the pixel electrode of an intersection position, by namely, the thing for which voltage

impression is alternatively performed to the 1st predetermined electrode Electric field can be generated between the 2nd electrode and a predetermined pixel electrode, and the liquid crystal which intervenes between these 2nd electrodes and a pixel electrode can be driven. Especially, in this invention, since it does not have the operation to which the 1st electrode changes the orientation of liquid crystal directly since the 1st electrode is formed in the bottom of a layer insulation film, it can prevent that the unnecessary reflected light arises in a proper display, and display quality can be improved.
[0012] Moreover, this invention can realize the penetrated type liquid crystal display of multiplex matrix composition by having a lighting means behind the 1st substrate while a pixel electrode, a layer insulation film, the 1st electrode, the 1st substrate, the 2nd substrate, and the 2nd electrode have permeability to the light for a display. Specifically, a silicon oxide (SiOx), a silicon nitride (SiNx), and post-wiring can be formed by ITO, and the 1st substrate can be formed [a pixel electrode] for ITO and a layer insulation film by transparent glass and transparent synthetic resin.
[0013] Furthermore, as for this invention, it is desirable that the 2nd electrode is a scanning electrode and the 1st electrode is a drive electrode. According to this invention of such composition, the number of drive electrodes can be increased without making the number of scanning electrodes increase, and drive control can realize easy and high definition electro-optics equipment.
[0014]
[Embodiments of the Invention] It explains based on the operation form which shows the detail of the electro-optics equipment concerning this invention hereafter to a drawing.
[0015] (Operation form 1) Drawing 1 - drawing 3 show the operation form 1 which applied the electro-optics equipment concerning this invention to the reflected type liquid crystal display. 3-fold matrix composition of the liquid crystal display of this operation form 1 is carried out. In addition, the plan in which drawing 1 shows the electrode structure of the liquid crystal display of this operation form 1, the cross section with which drawing 2 is equivalent to the A-A cross section of drawing 1 , and drawing 3 </A> are the cross sections equivalent to the B-B cross section of drawing 1 .
[0016] As the liquid crystal display 11 of this operation gestalt 1 is shown in drawing 2 and drawing 3 It has the back glass substrate 12 as the 1st substrate of the couple which counters, and the front glass substrate 13 as the 2nd substrate. The front glass substrate 13 of the back glass substrate 12, and the drive electrode 14 (14A, 14B, 14C) of two or more groups as the 1st electrode mutually formed in the field side which counters in parallel along the direction of a train (direction shown by the drawing 1 Nakaya mark y), the reflective pixel electrode 15 (15A and 15B --) connected to this drive electrode 14 15C is prepared and two or more scanning electrodes 16 as the 2nd electrode which extended along with the line writing direction (direction shown by the drawing 1 Nakaya mark x), and was formed in the back glass-substrate [of the front glass substrate 13] 12 and field side which counters in parallel are formed. Profile composition of the liquid crystal 17 is closed and carried out between these after glass substrate 12 and the front glass substrate 13.
[0017] Here, the composition by the side of the back glass substrate 12 is explained concretely. Although the back glass substrate 12 was used as a back substrate with this operation gestalt 1, a glass substrate 12 does not need to be transparent after this. the drive electrodes 14A, 14B, and 14C which were formed in the opposite medial surface (the front glass substrate 13 and field which counters) of a glass substrate 12 in parallel along the direction of a train (the arrow y in drawing shows) after this as shown in drawing 1 and which make every three groups -- two or more groups -- it is formed in parallel mutually In addition, the interval is set up so that the drive electrodes 14A, 14B, and 14C which constitute a group from this operation gestalt 1 may be settled in the bottom of the reflective pixel electrode 15 which is located in a line in the direction of a train and which carries out a postscript. Thus, the layer insulation film 18 has accumulated on predetermined thickness so that these drive electrode 14 may be covered in the opposite medial surface of the back glass substrate 12 with which the drive electrode 14 was formed in the shape of a stripe. In addition, a silicon oxide (SiOx), a silicon nitride (SiNx), etc. which are alike, for example and are formed as this layer insulation film 18 can be used.
[0018] And on this layer insulation film 18, two or more trains of the reflective pixel electrode 15 are mutually formed in parallel by the arrangement explained below. That is, the reflective pixel electrode

15 arranged on the layer insulation film 18 is formed so that a train may be made on the front face of the layer insulation film 18 along the extension direction (the direction of a train, the direction of arrow y) of the group (14A, 14B, 14C) of each drive electrode 14. Consequently, to the scanning electrode 16 formed in parallel with the front glass-substrate 13 side, the train of each reflective pixel electrode 15 has countered so that it may cross through liquid crystal 17 etc. (rectangular cross). It is countered and arranged so that the group of three reflective pixel electrodes 15A, 15B, and 15C may be settled within the width of face of each scanning electrode 16 among the trains of the reflective pixel electrode 15 arranged in the direction of a train. Thus, three reflective pixel electrodes 15A, 15B, and 15C which make a group are arranged in the position where the scanning electrode 16 and the train of the reflective pixel electrode 15 cross, respectively. Repeating the order of three reflective pixel electrodes 15A, 15B, and 15C which counter the sequential-scanning electrode 16, the train of the reflective pixel electrode 15 is set up so that it may travel through a viewing area along the direction of a train.

[0019] These reflective pixel electrodes 15A, 15B, and 15C are connected with the drive electrode 14 which corresponds, respectively through the through hole 19 formed in the layer insulation film 18 to three drive electrodes 14A, 14B, and 14C formed in the bottom of the layer insulation film 18. Specifically, reflective pixel electrode 15A is connected to drive electrode 14A through through hole 19A, reflective pixel electrode 15B is connected to drive electrode 14B through through hole 19B, and reflective pixel electrode 15C is connected to drive electrode 14C through through hole 19C.

[0020] In addition, in order to consider as the structure of connecting the ground drive electrode 14 and the reflective pixel electrode 15 through the through hole 19 formed in the layer insulation film 18 in this way the predetermined position (inside of each pixel electrode field) of the layer insulation film 18 -- photo lithography technology and etching technology -- using -- a through hole 19 -- opening -- carrying out -- each drive electrode 14 (14A --) the material metal (for example, aluminum --) which constitutes the reflective pixel electrode 15 after making 14B and 14C expose After performing deposition of a up to [the embedding of a through hole 19, and the layer insulation film 18] for silver, chromium, etc. using a spatter etc., it can form by performing patterning of the reflective pixel electrode 15 using photo lithography technology and etching technology. Moreover, after embedding in a through hole 19 and forming a plug, a pixel electrode material is made to deposit on the layer insulation film 18, and, subsequently patterning of the pixel electrode 15 may be performed. In addition, patterning of this pixel electrode 15 (15A, 15B, 15C) can raise a pixel numerical aperture by setting up the interval of pixel electrodes narrowly as much as possible. In addition, even if it narrows the interval of pixel electrode 15 in this way, since the drive electrode 14 (14A, 14B, 14C) is formed in the bottom of the layer insulation film 18, the drive electrode 14 does not interfere in the formation field of the pixel electrode 15.

[0021] Thus, including the pixel electrode 15 (15A, 15B, 15C) which makes two or more trains, on the layer insulation film 18, the whole viewing area is covered at least and the back orientation film 20 is formed.

[0022] Next, after describing above, the composition by the side of a glass substrate 12 and the front glass substrate 13 which counters is explained more concretely. the opposite medial surface (the back glass substrate 12 and field which counters) of the front glass substrate 13 is countered with each train of the pixel electrode 15 formed in the glass substrate 12, after describing above -- as -- the direction of a train -- meeting -- the pixel electrode 15 and abbreviation -- the light filter 21 of the same width-of-face size is formed in the shape of a stripe The light filter 21 is arranged so that it may repeat in order of light-filter 21R for red, light-filter 21G for green, and light-filter 21B for blue. Including these light filters 21R, 21G, and 21B, even if there are few opposite medial surfaces of the front glass substrate 13, the whole viewing area is covered, and the protective coat 22 is formed. Two or more above-mentioned scanning electrodes 16 as a transparent electrode are formed in the front face of a protective coat 22 in the shape of a stripe at the line writing direction. Furthermore, the whole viewing area is covered at least and the last orientation film 23 is formed in the front face of the protective coat 22 containing the scanning electrode 16.

[0023] As mentioned above, although the composition by the side of the back glass substrate 12 and the

front glass substrate 13 was explained, liquid crystal 17 is closed by the gap which these are stuck as countered through a predetermined gap through the sealant which was arranged and formed so that a viewing area might be surrounded, and which is not illustrated in the orientation film 20 and 23, and is formed by the back orientation film 20, the last orientation film 23, and the sealant, and the liquid crystal display 11 is constituted.

[0024] As mentioned above, in this operation gestalt 1, although the composition of the liquid crystal display 11 of this operation gestalt 1 was explained, in order that three pixel electrodes 15A, 15B, and 15C corresponding to each drive electrode 14A, 14B, and 14C may counter the field to which the group (14A, 14B, 14C) of the scanning electrode 16 and the drive electrode 14 crosses, 3-fold matrix composition is realized. Thus, since the pixel electrodes 15A, 15B, and 15C formed in an intersection field with the group (14A, 14B, 14C) of the scanning electrode 16 and the drive electrode 14 can be enlarged to the area near a pixel formation field, without receiving interference in the drive electrodes 14A, 14B, and 14C, a numerical aperture can be improved, and it becomes possible to perform the high display of brightness. Moreover, the drive electrode 14 also becomes possible [increasing the number of the drive electrode multiplexed to one scanning electrode 16] in order not to receive interference of the pixel electrode 15. Thus, since increase in a drive electrode number and improvement in a numerical aperture can be aimed at, the reflected type liquid crystal display of the multiplex matrix composition which can perform a highly minute and good display is realizable. Drawing 2 and drawing 3 show the state where it is reflected by reflective pixel electrode 15B, and the outdoor daylight which carried out incidence to light-filter 21G for green carries out outgoing radiation as a display light, becoming irregular by liquid crystal 17. In addition, in this operation gestalt 1, although light filters 21R, 21G, and 21B were formed along the direction of a train, respectively, along with a line writing direction, you may form in the shape of a stripe.

[0025] (Operation gestalt 2) Drawing 4 shows the example which applied the electro-optics equipment concerning this invention to the penetrated type liquid crystal display. In addition, the back glass substrate 12, the drive electrode 14, the layer insulation film 18, and the pixel electrode 15 consist of transparent materials, and except the point which is the composition equipped with the back light system 24 as a lighting system behind the back glass substrate 12, since both these operation gestalten 2 are the same as the above-mentioned operation gestalt 1, they give the same sign to the same portion, and omit explanation. With this operation gestalt 2, the light from the back light system 24 is modulated in each pixel portion, and outgoing radiation is carried out to the front through the predetermined light filter 21. The back light system 24 comes to have light source 24A, reflecting plate 24B, light guide plate 24C, etc. In addition, the operation and the effect of this operation gestalt 2 are the same as the above-mentioned operation gestalt 1.

[0026] (Operation gestalt 3) Drawing 5 - drawing 7 are the modifications of the operation gestalt 1 which applied the electro-optics equipment concerning this invention to the reflected type liquid crystal display. The plan in which drawing 5 shows the electrode composition of the liquid crystal display 11 of this operation gestalt 3, the cross section with which drawing 6 is equivalent to the C-C cross section of drawing 5 , and drawing 7 are the cross sections equivalent to the D-D cross section of drawing 5 . In addition, as for this operation gestalt 3, the group of a drive electrode consists of two drive electrodes 14D and 14E. Two pixel electrode 15D located in a line with the opposite position where the scanning electrode 16 and a drive electrode group cross in the direction of a train, It is arranged, and while corresponding pixel electrode 15D and corresponding drive electrode 14D are connected by through hole 19D, corresponding pixel electrode 15E and corresponding drive electrode 14E are connected by through hole 19E, so that 15E may counter with the scanning electrode 16. Moreover, it has the composition of not having a light filter at the front glass-substrate 13 side. In addition, since other composition in this operation gestalt 3 is the same as that of the above-mentioned operation gestalt 1, it gives the same sign to the same portion, and omits explanation.

[0027] With this operation gestalt 3, since two drive electrodes 14 (14D, 14E) are only arranged within the width of face of the line writing direction of the pixel electrode 15 (15D, 15E), the long drive electrode 14 of a width-of-face size can be formed more, and low resistance-ization of the drive

electrode 14 can be attained. Moreover, also in this operation gestalt 3, since the drive electrode 14 is formed in the bottom of the layer insulation film 18, the reflective pixel electrodes 15D and 15E cannot receive restrictions of the drive electrode 14, but can raise the area pulse duty factor (numerical aperture) of the pixel electrode 15 to a pixel formation field. Other operation and effects in this operation gestalt 3 are the same as the above-mentioned operation gestalt 1.

[0028] As mentioned above, although the operation gestalt 1 - the operation gestalt 3 were explained, various kinds of change which is not limited to these and accompanies the summary of composition is possible for the electro-optics equipment concerning this invention. For example, although considered as the drive electrodes 14A, 14B, and 14C which make a group by three, and the composition which it has with the above-mentioned operation gestalt 1, it can also consider as the drive electrode which makes four or more groups. Moreover, although each above-mentioned operation gestalt was explained to the liquid crystal display which used liquid crystal 17 as an opto electronics material with the application of this invention, it is good also as electro-optics equipment of composition of having made EL layer equipped with the charge transporting bed containing electroluminescence material, the luminous layer, etc. intervene. In this case, as for a pixel electrode, it is desirable to form with the low cathode material of work functions, such as In-Mg, and it is desirable to form with a high anode material of work functions, such as ITO, as a scanning electrode. Furthermore, although considered as the composition which multiplexes a drive electrode to a scanning electrode with each above-mentioned operation gestalt, it is also possible to consider as the composition which multiplexes a scanning electrode to a drive electrode.

[Translation done.]